EECE 210-Electric Circuits
Course Syllabus- Spring 2006-07
3 Credits

Catalog Description

A course on fundamentals of electric circuits; basic elements and laws; techniques of circuit analysis: node voltage, mesh current, Thevenin, Norton, and source transformation; operational amplifier; inductors, capacitors, mutual inductance; transient response of RC, RL, and RLC circuits; steady state AC circuits; circuit simulation using SPICE.

Prerequisites

High-school calculus including simple differential equations, algebra including complex numbers, and physics.

Instructor

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Textbooks

Nilsson J.W. and Riedel S.: Electric Circuits. Seventh Edition. Pearson Prentice Hall, Upper Saddle River, NJ, 07458, 2005. (Chapters 1–10)

Course Composition:

3 Lectures/week, Problem Solving Sessions, Drop Quizzes, 2 quizzes and a Final Exam.

Assessment

Final exam	40%
Quiz1	20%-March 23, 2007, Wing D, 5:30—7:00
Quiz 2	20%-April 25, 2007, Wind D, 5:30—7:00
Drop Quizzes	20%

Objectives

1. Introduce students to the basic circuit elements: resistor, capacitor, inductor, operational amplifier, and ideal transformer
2. Teach students the basic circuit analysis techniques and theorems
3. Introduce students to the transient analysis of RC, RL, and RLC circuits
4. Familiarize students with the sinusoidal steady state frequency-domain analysis

Learning Outcomes

At the end of the course students:

1. Become familiar with the scope and general nature of the fields of electric circuits
2. Acquire interaction and communication skills
3. Become aware of the relevance of the study of electric circuits to engineering
4. Acquire problem solving skills

5. Understand the fundamental laws of electrical circuit theory such as Ohm's law, Kirchhoff's laws, mesh analysis, and nodal analysis to solve simple circuit problems
6. Are able to apply the fundamental laws and concepts in analyzing resistive circuits containing controlled sources
7. Understand the concepts of maximum power transfer and of source transformation
8. Are able to determine individual linear responses using the superposition theorem
9. Are able to obtain Thevenin’s and/or Norton’s equivalent circuit models for active, one port networks
10. Are able to apply delta – wye or wye – delta transformation as necessary to simplify circuit analysis
11. Are able to identify and apply the most appropriate circuit analysis techniques and/or theorems for specific types of circuits
12. Are able to define/explain the voltage – current relationship and stored energy in inductors and in capacitors
13. Analyze and determine the complete response of RL, RC and RLC circuits
14. Are able to identify the frequency, amplitude, and phase of a sinusoidal voltage or current.
15. Are able to calculate the impedance of a simple circuit consisting of resistors, inductors, and/or capacitors.
16. Are able to calculate the power dissipated or supplied by an electrical component given its voltage and current
17. Have a basic understanding of op-amps and their applications.

<u>TOPICS:</u>

(Weeks 1-2/ 4 lectures)

- Circuit variables: Nature and limitations of circuit analysis, voltage, current, and power.
- Ideal circuit elements: Voltage and current sources, independent and dependent sources, resistance.
- Basic laws: Ohm’s law and Kirchhoff’s laws.
- Simple resistive circuits: Series and parallel connections, current and voltage dividers and measurement, the Wheatstone bridge, delta-to-wye equivalence.

(Weeks: 2-4 / 8 lectures)

- Techniques of circuit analysis: Node-voltage, mesh-current, and loop-current methods; Thevenin and Norton equivalents, superposition, and maximum power transfer.

(Weeks: 5-6 / 5 lectures)

- Operational amplifier terminals, terminal voltages and currents, the inverting and non-inverting amplifier circuit, the summing-amplifier circuit, and the difference –amplifier circuit

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(Weeks: 6-8 / 6 lectures)

- Inductance, capacitance and mutual inductance: Basic properties of inductors and capacitors, series and parallel combinations, mutual coupling and the concept of mutual inductance, and dot marking convention.

(Weeks: 8-11 / 9 lectures)

- Response of *RL* and *RC* circuits: Natural and step responses of *RL* and *RC* circuits. Sequential switching.
- Natural and step responses of *RLC* circuits: Under-damped, critically damped and over-damped responses.

(Weeks: 11-14 / 10 lectures)

- Sinusoidal steady-state analysis: Phasor representation; passive circuit elements in the frequency domain; Y-Δ transformation; techniques of analysis; ideal transformers.
- Average, reactive and complex power calculations; maximum power transfer.

Feb. 2007